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NONMICROWAVE HEALTH AND ECOLOGICAL EFFECTS: OVERVIEW

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This study is one of five being carried out, under the auspices of the Department of Energy, to assess the environmental impacts of the Satellite Power System (SPS). The assessment is using as a baseline the 1978 SPS Reference System developed by NASA and its contractors. The potential impacts are based on current knowledge with regard to the consequences of constructing and operating SPS as defined by the reference system. Studies of the nonmicrowave health and ecological effects encompass impacts on the public, the terrestrial worker, the space worker, and the ecology and agriculture.

For the public there are possibilities of increases in pollution (water, air, solid waste); noise near launch, landing and construction sites; transportation accidents (from both terrestrial transport of materials and space transport accidents); toxic materials exposure (from mining, manufacturing, and fuel use); eye injury from reflected light; skin cancer from reductions in ozone; acid rain; unusual weather changes; electromagnetic field exposure; and long-term, low-level effects from laser-beam scattering (lasers are being tentatively considered as an alternate to microwaves for transmitting solar energy to earth). The majority of the impacts for the public are expected to be increases in conventional hazards, and can probably be avoided by using methods and regulations now used by industry for mitigating unwanted effects. A few, e.g., launch and landing noise, and accidents or unique toxic materials, will need special planning and possibly research to avoid unduly endangering the public.

The terrestrial worker will be exposed to air and water pollution; all the conventional occupational hazards associated with mining, manufacturing, transport and construction; possibly exotic toxic materials; the noise and accident hazards at launch and landing of space vehicles; and the electromagnetic fields and high voltages at rectennas (earth-receiving stations). Again, most of the hazards to health are of a conventional type and probably can be mitigated with use of usual procedures and safety regulations. Such things as launch and landing noise and accident and exposure to unusual toxic materials will take special study and precautions to lessen hazards.

The space worker will be exposed to some conventional hazards, as well as the unconventional hazards of living and working in space. These will include space travel; effects of weightlessness; space ionizing radiation; occupational hazards of construction under weightless conditions; emergency medical and dental problems; extravehicular activity; psychological problems of extended confinement; life support failure; spacecraft charging (with possibilities of electric shock); electromagnetic field exposures; high voltage; and the possibility of meteoroid or space debris collisions. It is expected that current studies, research, improvements in design, etc., will assist in minimizing most of these hazards between now and the time when SPS goes into production and operation.

Ecology and agriculture will also be subjected to the conventional hazards of air, water, and solid waste pollution resulting from mining, manufacturing, transportation, and construction. At launch and landing and rectenna sites habitats or agricultural land will be lost and/or damaged. Wildlife and possibly agricultural animals will be disturbed by launch, landing, and construction noises, and may be disturbed by reflected light from the

space structures. There is a slight chance that ecosystems and agriculture may be damaged by ozone depletion (ultraviolet light) and by electromagnetic fields in the vicinity of rectenna and power transmission lines.

This assessment has been based on the 1978 reference system which was, of necessity, extremely preliminary in nature. Thus, much specific information needed to assess impacts in a quantitative manner was unavailable. The assessment was also constrained to use current knowledge, i.e., no research was involved. Therefore, there are still many uncertainties which must be resolved before impacts can be specified in detail.

Many of the people working in fields related to the potential impacts described in this assessment predict that ways will be found to mitigate or eliminate many of these impacts before SPS is put into operation. In order to minimize impacts, in-depth studies, research and design changes will be necessary.